**Mission Statement:** Design and build a testing fixture which can implement a controlled, known load and vibration onto K-Tron’s current load cell model, the SFT-II.

**Background:**
The load cell model currently in use is shown below. In a warehouse with machines running, these load cells pick up ambient vibration which produces error in current measurements. K-Tron will use our device as an aid to improve upon their load cells by filtering out these problematic frequencies.

**Choosing an Actuator:**
Certain metrics were re-evaluated to reduce the cost of the actuator, while still providing appropriate modeling conditions.

**Model:** PST 150/7/40 VS12
1.) Maximum Loading of 100kg
2.) Low end vibration boundary seen below

**Metrics**

<table>
<thead>
<tr>
<th>Metrics</th>
<th>Target</th>
<th>Achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td>frequency</td>
<td>1-120 Hz</td>
<td>27-120 Hz</td>
</tr>
<tr>
<td>max. load</td>
<td>120 kg</td>
<td>100 kg</td>
</tr>
<tr>
<td>acceleration</td>
<td>0.05-0.3 g's</td>
<td>0.05-0.3 g's</td>
</tr>
</tbody>
</table>

**Validation of System:**
- FEA model of bar subjected to a 45 N shear load
  - Free end deflected $6.32 \times 10^{-3}$ in
  - Resultant Factor of Safety: 70+
- FEA model of flexure subjected to 45 N shear load
  - Deformed $3.15 \times 10^{-5}$ in
  - Resultant Factor of Safety: 100+
- Stress calculated for the rod as a worst-case scenario: cantilevered beam
  - Stress calculated as 67.9 MPa
  - Factor of Safety: 5.7 (worst case)

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**Given Requirements:**
1) Vibration from 1-120 Hz with focus on 112 Hz.
2) Acceleration forces ranging from 0.05 - 0.3 g's.
3) Mass loading from 0-120 kg.
4) Maximum stroke length of 1 mm.

**Mass Application:**
- 10 modified Barbell Weights (11.3 kg)
- Inner collar used to reduce inner diameter and create slip fit with Acme rod

**Frame Design:**
- 2' x 2' x 1" steel plate for base
- 1" x 1" steel square tubing (supporting structure)
- 0.33 m long Acme threaded rod w/ Acme locking collar
- 2 flexure devices to force linear motion of system
- L-Bracket supports for flexure device extension
- Actuator adaptor and support block for protection from buckling under full loading

**Transition Plan:**
- Give K-Tron as-built prototype
- Perform tests on load cell with prototype to improve upon current technology